

What is friction?

Friction is a force that is exerted when things rub together. Friction can slow things down. The ice skates have very little friction on the smooth ice, so you can skate fast. The runner's shoes have good grip and make lots of friction with the ground to help her slow down and stop.

- a What kind of surfaces make the most friction?
- b What kind of surfaces make the least friction?

Friction can be useful

Friction can be a very useful force. Bikes and cars have brakes that use friction to slow them down or stop them. The surfaces of the brakes rub against the wheels so the wheels don't turn so fast. Some road junctions have a special high-friction surface to slow cars down in case they skid as they stop.

- c Give some more examples showing how friction is useful in everyday life.

Reducing friction

Sometimes friction is not useful and we want to reduce it. When two surfaces rub together, they will eventually become worn down because of friction.

Machines have a lot of parts that rub together. To reduce friction, we use substances such as oil and grease. We call these **lubricants**. They make surfaces run smoothly against each other. Surfaces that are smooth or are separated by air also have little friction.



Engine oil

Engine oil is a lubricant. It reduces friction and helps the pistons to move easily. In the winter, the engine oil gets very cold and thick so it doesn't flow as easily. Engines do not run as smoothly until the oil has warmed up. An engine must start easily on a freezing cold day and keep going on a long journey at temperatures as high as 90°C.

Did you know?

A hovercraft rides on a cushion of air. This reduces friction between the hovercraft and the water.



Friction makes things warm

Where there is friction, heat energy is given out. You can feel this happen when you rub your hands together. They feel warm.



Did you know?

It is illegal to drive a car with worn down treads or 'bald' tyres because friction between the tyre tread and the road prevents skidding on wet roads. But some racing cars have smooth tyres. This is because the rubber becomes very hot at high speed and sticks to the road!



Elijah McCoy

Elijah McCoy invented the 'Real McCoy Lubricating Cup'. Not many people know of his work. He was born in Ontario, Canada in 1844. Elijah's parents escaped from slavery in the USA. He studied mechanical engineering at Edinburgh University in Scotland and then returned to work in America.

Elijah worked on the railroads oiling the engines of trains. In his spare time he developed a self-lubricating cup that sent oil automatically to the engine, so that the train did not have to stop to be oiled. Elijah's device was described as the 'real McCoy'. It became so popular that people would ask if new equipment contained the 'real McCoy'. We still use the expression 'real McCoy' to mean the 'real thing'.

- d** Explain why is engine oil is less effective as a lubricant in cold weather.



Elijah McCoy and his invention.

Questions

- 1 **a** Describe how friction can be useful.
- b** Describe how the effects of friction can be reduced.
- 2 Write a story about a world without friction.
- 3 How do we know that heat energy is given out when there is friction?
- 4 Describe the problem that Elijah McCoy solved and his solution.
- 5 Plan a fair test to measure the thickness of engine oil at different temperatures. You are provided with water baths at different temperatures, thermometers, funnels, conical flasks, engine oil, measuring cylinders and stopclocks.

For your notes:

- **Friction** is a force that is exerted when things rub against each other.
- We can reduce or increase friction to make it useful to us.
- We use **lubricants** to reduce friction between moving parts.